GENERAL RESULTS.

The tests of the paper cups[4] were limited to low velocities, as these were used only in measuring natural wind. The following mean values of U were found:

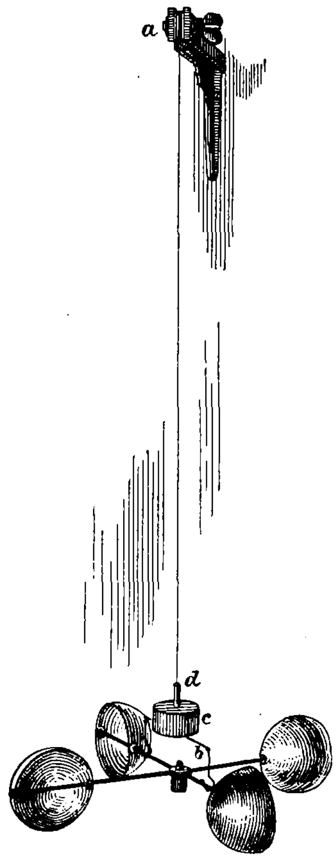

FIG. 7.

Paper No. 1.			Paper No. 2.			U deduced from 1888 experiments.
Number of tests.	Velocity, in miles per hour.	U.	Number of tests.	Velocity, in miles per hour.	U.	
4	5.45	486	4	5.44	485	494
4	10.00	556	2	10.20	560	525

The above results embrace in all only 14 tests, and yet the agreement may be regarded as very satisfactory. The value of U, given in the last column deduced from the experiments of 1888, applies strictly to an anemometer of greater moment of inertia than the paper cups, and according to theory should be slightly higher for the same conditions.

The mean results of the tests of the standard aluminum cup anemometer and of the No. 1 kite anemometer are given in the following table, together with the values of U deduced from the experimental work of 1888.

Standard aluminum cup anemometers.					Kite anemometer No. 1.		
Number of tests.	Velocity.	U.	U, 1888 experiments.	Difference.	Number of tests.	Velocity.	U.
....	....	......	....	....	2	5.56	1,484
4	10.98	581	530	−51	6	10.88	1,569
8	21.30	561	572	+11	11	21.25	1,563
8	30.25	584	593	+ 9	9	31.17	1,575
12	40.08	600	612	+12	18	40.85	1,584
4	48.88	604	626	+22	12	49.52	1,587

From the column of differences it appears that the new results show a slightly lower rate of speed of the anemometer in a given wind than formerly deduced. It is worth noting, however, that the sum of the plus and minus differences just balance each other, but we regard this as no more than a coincidence. Nevertheless, the results based on the greater number of observations show a very satisfactory agreement, the discrepancy being less than 2 per cent. We may therefore conclude that these tests in the open air afford a most substantial confirmation of the general accuracy of the older investigations which were made by a method that we now regard as less direct and trustworthy.

It is regretted that the crude and improvised installation of the apparatus and the insufficient power of the small engine available restricted the investigation in several ways and limited the speed attainable to velocities below such as frequently occur in regular station observations. The great irregularity of results unavoidably incident to this method of experimentation and the limited number of tests at each velocity thus far obtained, do not, in the writers opinion, warrant any further refinement of discussion than that given above.

An effort was made to ascertain the effect of tilting the axis of the anemometer forward and backward at moderate angles and the experiments noted in Table 2 were made. The results were, in some cases, vitiated by faulty action and were not on the whole satisfactory. Time was not available to continue these studies, but I think it is demonstrated that the error in the indications of an anemometer attached to a kite is not of a serious character, even when the axis of the instrument deviates continuously as much as 20° from the vertical. In good kite work the deviation can easily be reduced much below this.

In conclusion, it is noticed that the value of U for the kite anemometer for velocities from 10 to 50 miles per hour is almost constant, the extreme variation being only about 1.5 per cent. This again confirms a conclusion to this same effect reached in 1888, namely, that anemometers whose cups are large, as compared with the length of arms, run at a speed bearing a more nearly constant ratio to that of the wind than do anemometers with relatively longer arms.

[4] *Construction of paper cups.*—It may be interesting to know how the paper cups were made. A hemispherical metal cup, such as used on the standard anemometers served as a model or mould over which the paper cup was constructed. A strip of stiff, strong paper is cut out of sufficient length to encircle the mouth of the cup allowing a slight lap. One edge is subdivided into twenty equal parts, each of which is made the base of a gore or triangle with curved sides; that is, these gores correspond exactly to the spherical triangles on a globe between the meridians of longitude and with their bases at the equator. The superfluous paper between the gores is carefully cut away, except close to the base where all the gores join together. The strip of paper thus prepared can be fitted very closely to the metal form, and the edges of the gores united by gluing a narrow strip of thin linen paper over the seams. The apex or pole of the gores should be strengthened by a small disk of strong paper. A narrow girdle should also be fitted and glued across the gores at about 45° of latitude. The cups were mounted on slender wooden arms, to which they were secured by wax, one or two coats of shellac varnish were applied to keep out moisture. Carefully made cups of this character will run for some time in the ordinary gusty winds averaging from 20 to 25 miles per hour.

TWO THUNDERSTORMS AT THE ROYAL ALFRED OBSERVATORY, MAURITIUS.

By T. F. CLAXTON, Director, dated February 12, 1900.

The reproductions of the Mauritius meteorgrams (Chart XI) are more eloquent than any account of the two thunderstorms which occurred at the Royal Alfred Observatory on January 29 and 30, 1900; though a few words are necessary for the clear interpretation of the registers.

On the first day, January 29, thunder was heard from southward at intervals during the morning, and at $9^h 30^m$ a solar halo was seen. The sky became quite covered with heavy nimbus clouds soon after 13^h, and at $14^h 35^m$ rain commenced to fall, lasting till $15^h 5^m$, accompanied by occasional loud peals of thunder. The storm traveled from south to north-northeast passing slightly to the east of the observatory. The temperature began to fall before the sky was completely covered, and continued to do so until $14^h 30^m$; at $13^h 50^m$ the wind veered from north to south, and was from southeast by south during the rain which fell from $14^h 30^m$ to $15^h 5^m$.

On the second day the sky became covered with heavy nimbus clouds at $12^h 0^m$, and very heavy rain fell from $12^h 50^m$ to $13^h 10^m$. On this occasion the storm traveled from south-southwest to north-northeast, passing very nearly over the observatory; at the same time a second storm burst over the Ponce, a mountain 7 miles south by west of the observatory.

The fall of temperature during this storm was the greatest on record, viz, from 93.5° at $11^h 25^m$ to 72.0° at $12^h 58^m$. Here also the fall commenced some minutes before the sky became covered.

The sunshine strip shows a continuous burned line up to $11^h 53^m$, and a small spot at $12^h 0^m$.

Between $11^h 25^m$ and $11^h 35^m$, the wind veered from north-northeast to south, and was from the latter direction during the heavy rain which followed.

The registers are brought to the notice of meteorologists, with a view to obtaining further information on the effect of thunderstorms, and any such information will be much appreciated.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Journal de Physique. Paris. 3me série. Tome 9.
- **Brillouin, Marcel.** Origine, variation et perturbations de l'électricité atmosphérique. P. 91.
- **Teisserenc de Bort.** Étude de l'atmosphère dans la verticale par cerfs-volants et ballons-sondes. P. 129.

Scientific American. New York. Vol. 82.
- **Crafts, H. A.** Snowfall and Water Supply of the Rocky Mountains. P. 133.

Annalen der Physik. Leipzig. Vierte Folge. Band 1.
- **Schwalbe, G.** Uber die experimentalle Grundlage der Exner'schen theorie der Luftelectricität. P. 294.

Zeitschrift für Luftschiffahrt u. Physik der Atmosphäre. Berlin. 19 *Jahrg.*
- **Jacob, E.** Forsetzung der Betrachtungen über eine kinetische Theorie der Luftbewegungen. P. 5.
- **Nimfuhr, R.** Flugtechnische Betrachtungen (Schluss). P. 14.

Nature. London. Vol. 61.
- **Dexter, E. G.** Drunkenness and the Weather. P. 365.
- **Marconi, G.** Wireless Telegraphy. P. 377.
- **Wood, R. W.** Effects of Lightning on Electric Lamps. P. 391.
- **Halm, J.** Relation between the Periodic Changes of Solar Activity and the Earth's Motion. P. 445.
- **P., W. E.** Applied Meteorology. P. 448.

La Nature. Paris. 28me Année.
- **Jaubert, J.** L'Orage du 13 Février 1900. P. 210.

Naturwissenschaftliche Rundschau. Braunschweig. 15 *Jahrg.*
- **Fassig, O. L.** Typen des März-Wetters in den Vereinigten Staaten. (Abstract American Journal Science). P. 94.

Das Wetter. Berlin. 17 *Jahrg.*
- **Kasner C.** Der Mistral. P. 25.
- **Meinardus, W.** Ueber der Methoden der Maritimen Klimatologie. P. 28.
- **Bornstein, R.** Eine Verbesserung des telegraphischen Witterungsdienstes. P. 36.

Ciel et Terre. Bruxelles. 20me Année.
- **Vander Linden, E.** Prévision du temps pour une période de plusieurs jours. P. 589.

Proceedings of the Royal Society. London. Vol. 66.
- **Sworn, S. A.** Researches in Absolute Mercurial Thermometry. P. 86.

Gaea. Leipzig. 36 Jahrg.
- **Trabert, W.** Die Bildung des Hagels. (Schluss). P. 207.

Symons's Meteorological Magazine. London. Vol. 35.
- —— The Snow and Floods of February, 1900 [England]. P. 18.

Meteorologische Zeitschrift. Wien. Band 17.
- **Less, E.** Ueber den täglichen Gang der Sommerregen bei verschiedenen Wetterlagen. P. 49.
- **Bergholz, P.** Ueber Bildungsstätten, Bahnen und Zonen der Orkane des Fernen Ostens. P. 71.
- **Woeikof, A.** Arktis und Antarktis. P. 75.
- **Woeikof, A.** Al. v. Tillo. P. 79.
- **Hann, J.** Klima von Ponta Delgada. P. 80.
- **Hann, J.** Ueber eine als möglich gedachte Ursache der Wirksamkeit des Hagelschiessens. P. 83.
- **Hann, J.** Klimatabelle für Auckland (Neuseeland, Nordinsel). P. 84.
- —— Einfluss der Grossen Seen auf den Niederschlag. P. 87.
- —— Kohlensäuregehalt der Luft auf dem Montblanc. P. 87
- —— Neue tägliche Wetterkarten. P. 88.
- —— Das Vorkommen von Jod in der Atmosphäre. P. 88.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for February, 1900.

Stations.	Altitude.	Mean barometer.	Temperature. Max.	Temperature. Min.	Temperature. Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Prevailing direction. Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Colima	1,656	......	86.4	59.2	......	......	......	......	......
Culiacán Rosales (E. d. S.)	112	29.76	86.0	56 1	71.4	64	3.22	w.	......
Durango (Seminario)	6 243	24.00	77.0	28.4	54.5	47	0.94	sw.	sw.
Leon (Guanajuato)	5,934	24.28	79.0	36.1	59.4	44	0.04	sw.	sw.
Mazatlan	25	29.96	95.4	52.0	75.7	65	0.79	se.	e.
Mexico (Obs. Cent.)	7,472	23.03	79.0	35.6	59.0	49	T.	s.	w.
Morelia (Seminario)	6,401	23.96	76.8	39.9	59.7	54	......	sw.	sw.
Puebla (Col. Cat.)	7,112	23.36	75.4	39.2	61.5	60	T.	ene., e.	s.
Saltillo (Col. S. Juan)	5,399	24.74	76.3	25.2	52.3	58	0.98	s.	sw.
San Isidro (Hac. de Guanajuato)	......	......	69.4	56.8	......	......	T.	w.	......
Silao	6,063	24.26	74.5	44.2	61.5	47	0.23	w.	w.
Zapotlan	5,078	25.09	82.0	44.6	62.8	50	0.08	sw.	w.

EARTHQUAKES AT CARSON CITY, NEV.

By Prof. CHARLES W. FRIEND.

According to a letter recently received from Prof. Charles W. Friend, the geographical position of his private observatory at Carson City, Nev., is latitude N. 39° 9′ 47.2″, and longitude W. 119° 45′ 42.9″. The altitude above sea level is 4,660 feet. The observatory is well furnished with a 5-inch refractor by Clark, a 3-inch transit by Troughton and Simms, a chronograph by Fauth, sideral clock, chronometers, sextants, and astro-photographic apparatus.

The seismograph is a duplex pendulum pattern from designs by Prof. J. A. Ewing. Meteorological records have been kept tridaily at 7 a. m., 2 p. m., and 9 p. m., Pacific standard time, since 1880. In the following list of earthquakes the scale of terms used in the 6th column is that known as the Rossi-Forel scale, which reads as follows :